United Nations E/CN.17/2004/10/Add.5

Economic and Social Council

Distr.: General
17 February 2004

Original: English

Commission on Sustainable Development
Twelfth session
14-30 April 2004
Item 3 of the provisional agenda*
Thematic cluster for the implementation cycle 2004-2005

Discussion papers submitted by major groups

Note by the Secretariat**

Addendum

Discussion paper by farmers' organizations***

How to access and manage water in agriculture: the experience of farmers and their organizations

Contents

		Paragraphs	Page
I.	New developments and challenges	1–9	2
II.	Access to water	10–47	3
III.	Management of water supplies	48–112	8
IV.	Policy directions	113–119	18

* E/CN.17/2004/1.
** The views and opinions expressed do not necessarily represent those of the United Nations.
*** This paper was prepared by the International Federation of Agricultural Producers.

04-24340 (E) 110304

I. New developments and challenges

1. Over 1 billion people, one sixth of the world's population, still lack access to a safe domestic water supply: 2.4 billion people, half of the world's population, are without adequate sanitation. The demand for freshwater is increasing both from industry and the expanding urban areas; both are placing additional pressures on freshwater resources. As agriculture too continues to grow, so does its freshwater needs. The Food and Agriculture Organization of the United Nations (FAO) predicts that it will be necessary to double world food production over the next 25 years using essentially the same land area. Moreover, by 2025, more than three billion people will face water scarcity.

2. This alarming global picture shows the pressure on global water resources. Currently, about 70 per cent of the world's freshwater supplies are used for agriculture, 85 per cent by developed countries and the remaining 15 per cent by the developing world, where most of the population is rural and subsists on family agriculture. It is clear that, in order to achieve a sustainable agricultural sector, it will be called upon to increase the efficiency of its water use, that is, "more crop per drop". Consequently, sustainable agriculture must be made even more intensive and productive than it is now, despite the substantial productivity gains achieved over the last 30 years, which mostly apply to developed countries.

3. Increasing the land area under irrigation is one key element in making the land more productive. However, water constraints may well make expanding irrigation to feed an additional 1.5 billion people by 2025 very problematic. Therefore, future productivity gains must be achieved through sustainable intensification and more efficient use of limited resources such as water. Research on farming methods that minimize the need of water is needed. At the same time, farmers need to be more skilled and aware of this alarming picture. Taking into account the specific needs of the farmers and rural communities, it is important that national and international policies to solve the problem of access to water and the management of this scarce resource in the most efficient way be drawn up. In this regard, the role of farmers' organizations and their political positions are indeed crucial.

4. Issues concerning common access to and management of freshwater supplies have a central role in sustainable development and eradicating poverty. They have now been given priority in international policy as a result of the World Summit on Sustainable Development. The focus on water was intensified in particular in 2003, which was declared the International Year of Freshwater. In reaction to the pressures of development and population growth, many countries have begun to investigate approaches that can sustain their water use in the future. However, all countries do not face the same problems with respect to water resources. Some countries have excess water, while others face water scarcity problems. Appropriate water and food strategies must, therefore, be country, region, and location specific.

5. More particularly, countries must take into account the specific needs of the different user communities and find appropriate means to balance them off, without putting any of the communities, or their needs, at the fringe of decision-making processes. The knowledge on how to access and manage water resources in the most appropriate way is not only a technical matter but must rather be perceived in a holistic context, as the socio-economic and political dimensions are crucial elements of this paradigm.

6. Dealing with the issue of managing water in the most efficient way should go beyond the technical and economic aspects; the social component needs to be explored in a more in-depth manner if we want a voluntary change in behaviour.

7. This innovative way at looking at water issues puts the users in a position where they need to question themselves and face problems that seem to evade them. We need to put in place not only new technically and economically sustainable water management systems, but also systems that are socially and environmentally acceptable. Traditional water supply-driven management does not integrate the complexity of the social dimension which includes issues involving communication, raising awareness and the participation of different users.

8. In this new scheme, the involvement of farmers and their organizations, as well as other user communities, are considered key to the development of appropriate management frameworks. They must become more responsible and proactive in managing this scarce resource.

9. Experience shows how important it is for farmers to be proactive and involved in trying to change ways of managing water resources. Farmers throughout the world have interesting stories to tell of practical actions and voluntary initiatives, which demonstrate their willingness to safeguard natural resources while continuing to achieve food security with the means that they have available.

II. Access to water

10. Access to water is critical to agriculture. Rural communities in developing countries are the first to suffer from the lack of access to water resources. Rural areas are often remote and rural dwellers are often in a weak position to promote their interests. Instead of waiting for public authorities to solve their problems, farmers need to organize and be proactive in bringing about their own solutions. Through group structures, farmers can ensure that the needs and interests of the poor receive greater priority.

Specific experiences

1. Improving access to water in rural areas: the initiative of Liton Free Farmers Cooperative from the Philippines

11. Located in the southern Philippines, the Liton Free Farmers Cooperative was created by residents of a rice-farming village who saw the need to work together to address their economic problems. The cooperative's officials took the initiative to approach the Federation of Free Farmers/Federation of Free Farmers Cooperative, Incorporated (FFF/FFFCI) National Office for possible assistance in setting up a potable water system for their settlement.

12. The community faced several problems, including polluted rainwater and/or unhealthy shallow wells for their drinking, washing, bathing and other requirements; polluted nearby water tables owing to the intensive use of chemical fertilizer; and lack of a drainage system which had created stagnant water ponds.

13. The proposal was to set up a 10,000 gallon capacity water pump and tank and a web of water distribution pipes to provide clear and potable water to the 223 farmer-households.

14. The FFF/FFFCI National Office helped in locating a donor who provided a grant for the construction of the water tank and part of the distribution system. It also assisted the cooperative in securing a water permit from the National Water Resources Board.

15. In turn, the Liton Cooperative agreed to shoulder the costs of completing the distribution system, while their members agreed to shoulder expenses for in-house pipes, fittings, and related items. Each household was also required to install a water meter, which would be used for billing them for the maintenance of the water system.

Impacts

16. The village-based water system was the first of its type and scale in the province, given that most water systems are usually located in town and city centres.

17. The most tangible and immediate impact of the project was the improvement in the sanitation and hygiene in the community and the corresponding improvement in the health and general welfare of the residents.

18. Beneficiaries noted that the time they previously spent to haul potable water from remote areas was now being devoted to more housework and other constructive activities. The project also reinforced the unity and cooperation of the members of the cooperative, which was necessary not only for the continued success of their business projects, but also for the maintenance of their water system.

Lessons learned

19. The existence of a strong organization of project beneficiaries is critical in ensuring the efficient installation and sustained maintenance of the system. The cooperative's officials actually did almost all of the work, from contacting and negotiating with the water installation company, to supervising the construction of the system and securing the necessary water permits and laboratory clearances. In turn the farmer-members contributed by helping to construct the water system and setting up the pipe distribution network in the village.

20. This practical case shows that the existence of a farmers' organization can produce benefits beyond economic or business projects or traditional social advocacy activities. Cooperation between members of the cooperative served as the groundwork for the provision of other services to the members. For instance, the cooperative arranged for a consolidated electrical connection with the local electric company, so that the settlement is billed on one account, with the cooperative responsible for collecting the fees from individual households.

21. Although the cooperative is 4 kilometres away from the town centre, it had to secure a waiver from the town's water utility agency, which had apparently acquired prior rights and franchises over water tables in order to avoid conflict over water rights. This experience highlights the need for a clear water-rights policy.

22. There is a clear economic and social rationale for investing in basic utilities, such as potable water systems, in rural areas. If life in the rural areas becomes unbearable, it becomes difficult to stop the rural residents from migrating into town centres and cities for their survival. This will often result in congestion, urban squatting, health and sanitation problems as well as stress on water and other

utilities. Similar problems will crop up if Governments neglect rural roads, irrigation facilities and other basic infrastructure.

2. *Enhancing women's access to water through capacity-building and raising awareness*

23. Equitable access to water is a gender issue. Depending on cultural and traditional standards in the countries under consideration, the opportunities for rural women to access and control resources essential to their agricultural productivity are variable.

24. Rural women play an important role in the economic survival of their families. In addition to the unpaid work that they do, women produce most of the food in many developing regions. They are central to providing, managing and safeguarding water.

25. Yet women are often the ones who suffer most from the degradation of water and other natural resources. In rural areas, women, who are usually the custodians of family health, spend long hours fetching water for their families.

3. *Empowering Indian women to improve their access to water through training and raising awareness*

Context

26. In rural India, women spend several hours a day walking to conventional sources of water, like rivers, wells, ponds and lakes, in order to provide for their household needs. The introduction of tube wells and hand pumps has greatly improved the quality of life and reduced the distances that women needed to travel. However most of these wells were placed in places convenient for local authority bodies for maintenance, for example at the side of the road, not taking into consideration the users' needs. To overcome this problem, training was provided to women in the repair and maintenance of hand pumps, so that the wells could be located in the village.

Impacts

27. In instances where women received training, the ownership of these facilities greatly improved. The training provided the women with a sense of empowerment and control, allowing them to be self-reliant.

Lessons learned

28. The participation, and inclusion, of women in local governance bodies has greatly aided in making water supply a matter of priority. After the introduction of mandatory positions for women in the membership and for the presidency of local bodies, water became a priority in governance at the local level. Capacity-building for women and their involvement was essential to the improvement of water conservation and access.

4. Watershed based soil and water conservation in Kakkad region of India.

Context

29. The Kakkad region was marked by a high rate of male migration in search of employment, leaving behind women who were ignorant of water and soil conservation techniques. A project under the science and technology division of the local state put forward an initiative that centred on education and capacity-building for women in water and soil conservation.

Impacts

30. The project aimed at organizing women into groups, raising their awareness of the current problems and issues involved, while illustrating strategies that could be used to alleviate the effects of water and soil degradation. The women, and the community itself, were involved in the problem of identification, prioritization and watershed delineation. Soil and water conservation received attention from a well-informed community, which implemented strategies founded on a knowledge base that they acquired through this project.

Lessons learned

31. The examples in both of these Indian communities show that women's involvement in water maintenance and conservation strategies not only strengthened their capacities as active participants, but also resulted in water being put forward as a priority. Since women usually take on the role of water custodian, giving them access to technological knowledge, scientific management capacity and political empowerment allows them to more accurately administer water as a precious renewable resource.

5. The use of appropriate technologies for accessing water resources

32. The use of appropriate technologies has to be distinguished from traditional systems or practices. Technologies have to be adapted to local conditions and should be accessible to the producers to meet their specific needs. In other words, high-energy using technologies are not necessarily adaptable to the needs of certain poor rural communities.

33. Whatever technologies are used by water supply systems, they need to be maintained. Local populations are more motivated to maintain water supply systems if the technologies are adapted to their given environments and to their level of skill.

6. The use of traditional knowledge in irrigation: the **foggara** *system in Algeria*

Context

34. A traditional form of irrigation called *foggara*, whose origins can be traced back 3,000 to 4,000 years, is an alternative to modern irrigation. *Foggara* is used in southern Algeria on conventional farms and serves as a source of water for several oases in the Ouled Saïd, a human-made wetland that covers an area of 25,400 hectares in south-western Algeria.

35. *Foggara* was first practised in the Islamic Republic of Iran and brought to North Africa during the second expansion of Islam. The *foggara* system is a

complex network of vertical shafts dug into a sloping plateau overlooking an oasis. These vertical shafts or wells are connected by an underlying channel, which has a gradient flatter than that of the ground. Water is drawn from an aquifer within the plateau by the force of gravity and directed through the channel to the surface for agricultural or domestic use.

Impacts

36. There are three significant benefits of the *foggara* system of water delivery, including:

(a) Water loss through seepage and evaporation is reduced because a majority of the channel is underground;

(b) The need for pumps is eliminated as the system is fed entirely by gravity;

(c) The exploitation of groundwater as a renewable resource.

7. *The zai system: a traditional system of water conservation*

Context

37. Practised mainly in Mali, Burkina Faso and Niger, where it is known as tassa, zai is a traditional technique for conserving water and rehabilitating degraded land. The zai system is a series of human-made pits or holes, dug on abandoned or unused land. The purpose of creating the holes is to capture runoff precipitation, because the land is typically less permeable to water. The zai pits are filled with organic matter so that moisture can be trapped and stored more easily. The pits are then planted with annual crops such as millet or sorghum.

Impacts

38. The zai pits extend the favourable conditions for soil infiltration after runoff and they are beneficial during storms, when there is too much water. The compost and organic matter in the pits absorb excess water and act as a form of storage for the planted crops.

39. Zai pits are dug approximately 80 centimetres apart to a depth of 5 to 15 centimetres with a diameter of 15 to 50 centimetres. No special equipment or knowledge is needed to adopt the technology and the cost of implementation is mainly calculated according to the amount of time spent by the farmers in their construction.

40. The maintenance of the pits requires that farmers invest additional time in watching over, deepening and refilling them. However, the economic returns on the investment is 100 per cent, because the land brought under production is abandoned or unused land.

41. The success of zai planting pits has been documented all over the Sahel region, where the pits are often dug in combination with the construction of contour stone bunds and the planting of trees. One disadvantage of the system is that the pits may become water-logged during extremely wet years.

8. Conserving a traditional water system through modern enhancement: rehabilitating wells in Finland

Context

42. Finnish geology is particularly endowed with an environment that fosters small ground pockets that are fairly near the soil surface. This favourable circumstance allows landowners to dig wells and have access to water directly. As a result, there is a proliferation of wells in Finland, although many of the wells in the countryside are old and their structure has deteriorated over time.

43. The most common problem that affects the structure of the wells is when surface water leaks into the well, degrading the quality of the water in the well itself. Since these wells represent the most important water supply for farmers, the Government has put forward a financing initiative for structural upgrading of the wells in the countryside.

44. The Finnish Government, through the Ministry of Agriculture, has provided a guide on how to restore the wells and has supplied an aid package of 30 per cent of the reparation cost, with specific guidelines requiring strict adherence in order to qualify for financial aid.

Impacts

45. Farmers were able to utilize the benefits of modern technology to enhance the structural integrity of their traditional wells. Farmers were able to restore or rebuild wells to meet their drinking and household needs, while adhering to strict quality standards.

46. The ability of the farmers to utilize modern technological upgrading of a traditional water management tool greatly enables them to manage this resource in a more efficient way. Since farmers in rural areas are responsible for their own water supply, well reconstruction allows them to maintain control over the quality of the water that they extract and gives them the ability to utilize water for agricultural activities, such as dairy farming, without compromising either the quality or control of their water supply.

Lessons learned

47. This practical case serves as a good illustration of the benefits of upgrading traditional technologies in order for farmers to keep control over their water supply, while conserving the quality of the resource. This sometimes requires governmental support, which is often lacking in developing countries.

III. Management of water supplies

A. Participatory methods

48. In order to be equitable and sustainable, water management and development has to be conducted on a participatory basis, with decision-making occurring at the lowest appropriate level. All water users and stakeholders, especially farmers, men and women, young and old, both in developed and developing countries, whose

actions affect the quantity or quality of water, should have a say in water management. The following examples illustrate the benefits of involving farmers in the decision-making processes.

Specific experiences

1. ***Farmers in Sweden participating in an awareness campaign to enhance the quality of water***

Context

49. The Swedish parliament has adopted 15 environmental quality goals, many of which concern agricultural sustainability criteria. A 2020 target has been set by the Swedish Government to achieve these goals (except for the climate objective, which has to be implemented by 2050). An innovative and complementary approach to the scientific and legislative implementation of these 15 new Swedish environmental goals has been initiated by the farmers themselves. For some time, farmers have advocated that participatory methods, cooperation, involvement and voluntary approaches would achieve better results over the long run. The Government has recognized the importance of public participation and bottom-up involvement, which call for a larger choice of implementation methods to achieve the environmental goals.

2. ***Participation of Swedish farmers in the project: "Focus on nutrients"***

50. An interesting illustration of farmers' participation in Sweden is the project entitled "Focus on nutrients", which focuses on the protection of water from pesticides and the reduction of nutrient losses in the water. Focus on nutrients is a joint-project between the Swedish Board of Agriculture, the County Administration Boards, the Federation of Swedish Farmers and a number of companies in the farming business.

51. The project takes the form of a campaign, officially launched 2001, which aims at providing training and advancement of the overall objective of the project, encompassing the entire flow of nutrients on the farm. The campaign will continue for at least five years. The ultimate objective of this campaign is to increase the efficiency of nutrient management on farms through raising awareness and knowledge sharing. Individual farm visits are organized by farm advisers, placing the farmer at the core of this campaign, and there are ongoing study circles.

Impacts

52. It is too early to evaluate the project and its effects on water quality, however expectations of the outcomes from the campaign are high, both in the farming sector and among public authorities.

53. Farmers show high interest, with around 4,000 participants covering 44 per cent of the arable land in the southern part of Sweden.

54. An important factor in the success of the project has been the great number of organizations involved. About 40 different farm advisory bureaux, with 200 advisers, are involved on a part-time or full-time basis, to provide environmental advice on farms.

55. The most important method used is called "farm-gate nutrient balances". This method of nutrient balances has been successfully used in a previous Swedish project, where farmers calculated yearly nutrient balances for seven years. The results indicate that there is a great potential for improvement, with the most visible progress achieved when a farmer calculates the nutrient balance for the first time.

3. Farmers water quality management groups: a voluntary farmers initiative

56. In some places in Sweden, farmers have started to organize and collaborate on the improvement of water quality at the local level. These groups usually consist of 10 to 30 farmers that gather around their local stream, carrying discharge from their farmland. The motive for this voluntarily work is to use a bottom-up approach to the improvement of water quality and to stay ahead of authorities in this regard. An important part of the work is to increase knowledge and awareness of methods of cultivation that are important in preserving the quality of water. Evening classes are commonly given and study trips are organized to other farmers or to field experiments where measures to reduce nutrient leaching are tested.

Lessons learned

57. Even though creating incentives for all users to participate in water management processes is complex, the returns in terms of improved water management, reduced conflict and the long-run sustainability of systems make this a vital investment.

4. Participatory activism through volunteering: Indian village of Monody

58. The village of Monody was experiencing irrigation problems owing to the fact that one of the major canals, which was approximately 28 kilometres in length and which was used to deliver water, was silted up and nearly non-operational. The silting meant that the canal was no longer fully functional for carrying water to the fields. Previous requests to the local government had gone unheeded, as the government itself did not have the budget to undertake such a project.

59. A planning commission from the government of India initiated a proposal to undertake a development initiative by mobilizing the collection of all locally available technical, financial and physical resources. Subsequently a village development committee was set up to administer the project. One of the most important features of this collaborative effort was the ability of the village to supply free labour for the project. The village committee worked out that the project's duration was going to take 3,000 man-days of labour. It approached 3,000 households in the village to provide one member of their household for one day of labour, or wages to employ one person. The majority of the households supplied the project with free manpower, and the village, in turn, provided food for the labourers.

60. Work on the project was carried out daily. Upon completion, the work was inspected by the Engineering Department. The canal has now been restored to its full working condition. The Agricultural University also provided inputs, advising the village on issues such as soil restoration, plantation and pest management. As a result, a significant improvement in the agricultural production of the local villagers has been observed, as well as an increase in their economic standing.

Lessons learned

61. In this example, the Government played an advisory role, but the village itself reaped the benefit of its own collaborative effort in spearheading the project. The communal effort and organization illustrates that chances at success are improved by the participation and mutual help of local communities. It is also clear that the community took the initiative to resolve its problem using available resources.

B. Participatory frameworks

62. Community-based participation through the creation of consultation frameworks must be a prerequisite for successful water management.

Specific experiences

1. Water Users' Associations in Tunisia

63. The Tunisian Government has decided to transfer the management of irrigation and drinking water schemes to Water Users' Associations. The involvement of water users in the management of the resource has been very important in changing the social concept of water and in redefining its value in economic terms. Increased awareness of the scarcity of water and the need for its rational use has been a success of this policy.

Context

64. Water users' associations (WUAs) have a long history in Tunisia, having been first created during the early 1900s. These associations were charged with solving water management problems and ensuring efficient water distribution. In 1987, their mandate was redefined to include the implementation, operation and maintenance of irrigation-drainage or potable water supply infrastructures. The associations are financially autonomous and managed by a governing council, which includes a president, a treasurer and elected members. In Tunisia, the associations are responsible for more than half of the public irrigation schemes in the country.

Impacts

65. In 2001, water access and distribution in rural areas was increased by 90 per cent through the efforts of water users' associations and the *Société Nationale d'Exploitation et de Distribution des Eaux* (SONEDE), a government agency. There are 2,470 water users' associations operating in Tunisia: 63 per cent are responsible for providing drinking water, 34 per cent for irrigation and 3 per cent for both. The associations have alleviated the impact of poverty in poor communities by improving access to water resources.

66. The Government's policy of transferring the management of water services to water users' associations has been successful because of the establishment of the Fonds National de Solidarité. This government programme was created in 1992, with the aim of providing infrastructure in rural areas. The skills of water users' associations in the financial and technical management of water services were reinforced by this programme. The Fonds National de Solidarité is funded through

voluntary contributions by public and private enterprises, international development agencies, private individuals and the national Government.

2. *The cost of water and of its efficient use*

67. Who should pay for the use of such a scarce resource as water is indeed a complex issue, which needs to take into account several factors.

68. Farmers, through the development of rational systems in managing water resources, can achieve substantial quantity and economical savings.

3. *Finnish cooperatives and the price of water*

69. The example of Finland can be used to illustrate the ability of farmers to organize in order to maintain low prices for water resources. In rural Finland there are about 1,000 water cooperatives and about 400 small limited water companies. A majority of these water associations service very small towns and villages that, on average, have less than 200 inhabitants. Among these associations are cooperatives, which service less than 100 inhabitants. These associations have grown in significance as the most important source of water supply in rural Finland.

70. The cost and investment of running a small-scale water cooperative is very small. All cooperatives are licensed by the Government and are allotted a limit as to the amount of water they are allowed to extract per day.

71. The Finnish Government also makes financial programmes for further investment available to cooperatives. In addition, members may choose to participate by providing labour instead, in order to decrease costs for projects that require reconstruction. Cooperatives have their own wells and distribution networks, and complete control over prices. As a result, cooperatives can offer water at reasonable prices to their members because the price of water is not influenced by fluctuations in the market.

72. Water cooperatives also have the benefit of networking with other participating cooperatives. This cross-organizational aspect allows for a far greater level of manoeuvrability and adaptability in various situations. If, for example, the water quality in one region is not good, the cooperative may buy water from a neighbour cooperative or a community-owned water network. This form of inter-cooperative assistance allows for these associations and their members to benefit from mutual aid that is low in price and dependable.

73. Cooperatives are a vital component of the Finnish rural sector and a good example of how mutual organization, cooperation and activism work in unison to achieve inexpensive access to water.

C. Innovative partnerships

74. Farmers often have the willingness, although not necessarily the required means (financial, human, institutional) to cope alone with improving water management systems. They often need to be supported and encouraged to take on initiatives. In this regard, the key to better water outreach is the development of innovative partnerships. There is therefore a need for appropriate frameworks to build and implement partnership initiatives to manage water.

75. Organizations and water users often do not have the finances, knowledge, right institutions or incentives to use new technologies. The private sector has the means but often does not have the experience to ensure the efficient and equitable water management policies that national authorities might otherwise implement. Partnerships are therefore needed.

76. New forms of partnership also need to be promoted. Instead of separate government agencies for irrigation, water supply, sanitation and environment, effective water management organizations should include new combinations of public sector, private sector and farmers organizations to seek fitting solutions. For instance, management of river basins and irrigation areas should be in the hands of local and regional governments as well as farmers' organizations.

77. There is also an urgent need for cooperation between donor agencies and the industry, in order to achieve the transfer and adaptation of the best technologies for the benefit of developing countries. South-South technical cooperation is also an important element that should not be overlooked.

Specific experiences

1. ***Partnerships between farmers and owners of water quotas: the example of southern Algeria***

78. In the desert, land alone is not considered real capital, as its value is intrinsically tied to water rights. The ownership of water can be acquired through the investment of labour or money in the construction of a *foggara*, a traditional form of irrigation in the oases of the North African Sahara. Partnership agreements between the owners of unirrigated land and the owners of water quotas determine the share of water received by each recipient within the partnership based on the size or level of investment contribution. For regions of Algeria where this type of socio-economic arrangement still persists in conventional agriculture, the operators of *foggaras* have set up professional associations.

79. In one region of southern Algeria, there are partnerships, "association-sharing", between owners of unirrigated land and owners of water quotas for the production of palm dates. In this type of agreement, the owner of the unirrigated land transfers half of the property rights on his land to the owner of the water quota. After approximately seven years, when the palm trees first bear fruit, the "association-sharing" ends. At this time, the landowner assumes permanent ownership of the water on his land. Both individuals benefit from this type of partnership as each claims half the ownership of a palm grove that would not exist without *foggara* irrigation.

2. ***Partnerships between farmers and researchers "Swedish success story on catchments pesticide management"***

80. In the framework of a pilot study, which benefited a small catchment area in the south of Sweden, farmers achieved a 90 per cent reduction in findings of pesticide residues in a one-year period. The work was carried out in close cooperation with a scientist and a farm adviser. All farmers were interviewed on what procedures they were using when spraying. Yearly meetings were held on how to improve the management of pesticides.

Impacts

81. Information sessions led to an improvement in handling procedures such as filling and cleaning. Weeds on the farm were controlled mechanically instead of chemically in many cases, and in cases where spraying was continued it was conducted at a safe distance from the stream and wells.

82. After 10 years, concentrations of pesticides had decreased by 90 per cent in the small stream. Yields were not affected by the improved handling procedures, the measures were cost effective and the farm did not suffer any economic loss.

3. Partnerships between the farmers, the private sector and water rights authorities: example of farmers of "Zirking" (Upper Austria) and the water supply company "Fernwasservorsorgung Mühlviertel"

Context

83. The protection of groundwater in Austria — 99 per cent of Austrian drinking water is groundwater or source water — is achieved through both regulatory and voluntary measures. Voluntary measures include either environmental programmes which are part of the rural development programme, or contracts between farmers and water supply companies.

84. Frequently, the relationship between water supply companies and farmers who must tolerate regulatory production restrictions to protect water sources is burdened by tension and sometimes even outright confrontation.

85. Since some of the wells in the Zirking area do not supply the best quality water, in 1996, under the Austrian water law, it was named the first redevelopment area by the water rights authorities. Under the leadership of the agricultural chambers, the affected farmers organized themselves and established a democratically elected working committee, which developed, internally, into a decision-making forum and, externally, into the legitimate opposition to the public authorities and contact body. In addition, the committee had an important impact on the amendments to the Austrian water law concerning the existing groundwater redevelopment terms.

86. According to the new legal situation, the water rights authorities conceived the idea of enacting drastic production restrictions for farmers through conservation area regulation. The draft would have entailed an intensification of agricultural requirements, which met with strong opposition from farmers.

87. The counter-proposal from the agricultural sector reshaped the model to an effective, non-bureaucratic water pollution control concept tailored to practical requirements, while simultaneously abandoning the prospective regulations. The water rights authorities gave the green light to the pilot project, provided that the water pollution control resolution proves to be just as effective as the planned regulation in guaranteeing protection targets.

88. After numerous negotiations, an agreement was finally reached with the authorities and the water supply company with regard to financial compensation and the implementation of the package of measures. The water rights authorities agreed to that proposal. However, the degree to which individual farmers commit to any of

these measures remains their own decision. Nevertheless, an attractive system of premiums has stimulated a high level of participation.

Impact

89. Within the first year, 86 per cent of the eligible farmers signed on to the contracts — a high level of participation, although the area covered by the original plan was ultimately reduced in size by almost half.

90. The excessive terms regarding the use of herbicides, which had been solely a precautionary measure and would have accounted to a near application ban, were eliminated through negotiation, with the difficulty of applying regulatory conditions giving way to a more intelligent model, with a catalogue of measures built on the Austrian environmental programme.

91. After this experience, the farmers of Zirking are convinced that voluntary participation in the water pollution control project and the simultaneous responsibility that grew from it, was the best way to achieve the successful protection of groundwater.

Lessons learned

92. The example above shows that local partnerships with contractual regulations between farmers and water supply companies can prove successful and are well accepted by the water rights authorities as a non-bureaucratic way to achieve a common goal: the protection of drinking water resources.

D. Efficient and rational use of water resources

93. Increasing the efficiency of water use in farm operations makes economic sense, ensuring that scarce water resources are protected for future generations.

94. Sustainable agriculture should be based on a wise use of all available resources. Technical improvements may not be sufficient when cultivated crops are not suited to the climate and to the availability of the water resource. For this reason, it seems important to combine both technical and managerial means and to seek an optimal combination of all water uses.

95. Increasing the combined value of all water uses calls for more attention to water quality, rather than just quantity issues. Waste disposal, therefore, becomes critical to sharing water among different uses. Upgrading efficiency in all water uses is of utmost importance. In short, the managerial approach should be multisectorial.

Specific experiences

1. Water audits: an innovative approach to agriculture in the United Kingdom

Context

96. An agricultural water audit is a detailed analysis and account of water use in an agricultural operation. A complete water audit includes both an outdoor and indoor component, which must describe where, how and why water is being used in a

farming or livestock operation. It should also include how water use can be reduced without compromising crop quality and yield or animal welfare.

97. An agricultural water audit should be simple, yet effective. The process should highlight the practical steps that the farmer or grower can take to create an immediate impact on a farm's water management. The loss of soil, nutrients and other farms inputs as diffused pollution is reduced when water use is analysed and accounted for.

98. The National Farmers Union in the United Kingdom launched its Water Wise campaign in November 2000 to promote efficient water use on the farm and to demonstrate and discuss best irrigation practices. In the summer of 2001, the Union conducted a survey among all its members to document water use on farm operations. It found that farmers were taking the initiative to increase the efficiency of water management on their farms.

99. The Water Wise campaign is an effort by the National Farmers Union to encourage the agricultural industry to improve water use efficiency ahead of impending European and national legislation. A guide called "Water Wise on the Farm, a simple guide to implementing a water management plan", developed by the Environment Agency and LEAF (Linking Environment and Farming) organization, and supported by the National Farmers Union, was launched in November 2002.

100. Five simple steps for carrying out a water audit and developing a water management plan are outlined below:

- Identify how much water the farmer is using and its cost
- Water use inventory
- Calculate how much water the farmer is using
- Identify and compare water efficiency activities to reduce water use
- Create, implement and review the farmer's Water Wise action plan.

101. After choosing an appropriate water efficiency activity, a Water Wise action plan must be created and implemented. The action plan includes: (a) how the farmer plans to save water; (b) targets for water savings; (c) targets for financial savings; and (d) who is responsible for each action.

102. When implementing the plan, the following issues must be addressed: (a) staff, family and conductor awareness of the need to save water; (b) timing of improvements; (c) routine maintenance and checks; and (d) monitoring and reviewing progress. It is very important that a review be conducted after a plan has been implemented. The ideal time for a review is approximately a year after the plan has been implemented.

Impacts

103. The results of the Water Wise Survey demonstrate that farmers are very conscious of water management and are pursuing measures to reduce waste and improve water efficiency. A summary of the results of the Water Wise Survey reveal that:

- Two thirds of respondents said they are more efficient with their water use today (2001) than they were five years ago

- More than half of the respondents made plans to improve their water efficiency over the next five years
- Nearly 40 per cent either collect rainwater or recycle water for use on the farm
- Nearly 70 per cent have invested in reservoirs or storage tanks in order to store water for use later in the year
- Fifty per cent of respondents use scheduling techniques in irrigation to make sure they are using water at exactly the right time of day to avoid waste
- Eighty per cent of respondents regularly test soil moisture levels in order to ensure delivery of appropriate levels during irrigation
- More than two thirds of those who irrigate store water for use later in the year.

2. ***Drip irrigation in Kenya: a cost-effective method for small farmers***

Context

104. Agriculture in the country is mainly rain fed. Irrigated agriculture is underexploited, with only 13 per cent of the country's irrigation potential being utilized. Despite the creation of the National Irrigation Board for irrigation management, little progress has been made in increasing the hectares of land under irrigation.

105. Some of the problems that have plagued the National Irrigation Board include: lack of participation of farmers, competition from cheap imports, high running costs of schemes, and inadequate funding from the State.

106. For many smallholder farmers, the high cost of irrigation equipment makes them reluctant to adopt irrigation technology.

107. The introduction of a simple, cost-effective drip irrigation system has made it possible for many farmers to irrigate their fields and kitchen gardens. This system is easily assembled and can be adapted for individual farm conditions.

108. The drip irrigation system consists of a network of porous or perforated piping that is installed on the surface or below ground. This plastic piping is usually laid alongside the rows of planted crops, allowing water to be directly applied to the root zones of the crops in a slow and controlled manner that reduces evaporation loss.

Impacts

109. The use of this technique reduces water use by 40 to 60 per cent, while the increase in yield can be as high as 84 per cent.

110. Advances in drip irrigation technology have made it more cost-effective and accessible to smallholder farmers. In 1996, the Kenyan Agricultural Research Institute introduced bucket drip irrigation kits developed by Chapin Watermatics. A typical bucket drip irrigation kit costs $19 and includes a 20 litre bucket, or a 200 litre drum, drip tape, filters, rubber washers, male and female adapters, two supple tubes, bard fittings and a screen filter.

111. The buckets are mounted on a stand one meter off the ground with drip lines connected at the bottom. Water is poured into the buckets and released under pressure. This system is considered a low-head drip system since standard drip

systems operate under greater pressures. In dry areas, where water has to be carried for long distances, this system is ideal as it requires less water and it allows every drop to be used efficiently.

Lessons learned

112. Drip irrigation is a good example of a low-cost device that helps farmers increase their yields while using water resources efficiently. In particular, approximately 70 to 80 per cent of drip irrigation users are women, who use this technology to maintain their kitchen gardens. As a result, the introduction of drip irrigation has enabled many families to have vegetables in their diets all year round, and in some cases it has allowed them to sell the excess to supplement their incomes.

IV. Policy directions

113. A wide variety of specific experiences have been discussed in the present paper, yet all of them show that farmers and rural communities are motivated and willing to become responsible for efficiently managing water resources, and for developing new and innovative agricultural production methods that conserve their water supplies. A policy approach based on stakeholder participation and giving responsibility to users in the management of water resources is proving to be an effective way of using water well.

114. In the cases where farmers engage in protecting water resources on a voluntary and participatory basis, this has proved to be beneficial to their living and production conditions. It has also been seen that collaboration and dialogue with public authorities often proved to be valuable.

115. Multistakeholder partnerships also appear to be an effective tool for good management of water supplies. Even though it is important to set up clear rules and regulations to support the efforts of farmers in managing water resource more efficiently, legislation alone is not always the only way to solve problems. Informal agreements between farmers' organizations and other stakeholders, such as private companies and research institutions, represent valuable alternative methods that need to be given further consideration.

116. Raising the awareness of farming communities on ways to improve production while using water resources more efficiently must be given a higher priority, especially in those regions where this is not developed. For that reason, farmers and their organizational capacities need to be strengthened, enabling them to be proactive in safeguarding this natural resource. Farmers know their natural environment well, and helping them with structural problems, such as finding the necessary resources (financial, human, institutional), will help them use their unique knowledge in the best way. Collaboration is thus of the utmost importance.

117. Collaboration with the scientific community needs to be encouraged as it is an essential partner in developing technologies and farming techniques for water conservation that build on the local knowledge of farmers.

118. Farmers have interesting experiences to share and the capacity to change and improve their standards of farming, and their standards of living.

119. Access to water is critical to agriculture, and agriculture is critical for food security and rural development. "Win-win" partnerships are badly needed in order to face the challenging issue of protecting our precious natural resources, while at the same time doubling world food production to meet the needs of the growing population.